

CLAIMS

I CLAIM:

1. An apparatus to control the rate of flow of a stream of pressurized fluid through
5 a conduit, the apparatus comprising:
 - (i) a flow measurement device operatively connected to said conduit, said
flow measurement device generating an output signal proportionate to
the rate of flow of said fluid therethrough;
 - (ii) a flow control device operatively connected to said conduit, said flow
10 control device including an adjustable orifice wherein upon the opening
of said orifice a portion of said stream of pressurized fluid is
independently released from said conduit by said flow control device;
and,
 - (iii) a controller operatively connected to said flow control device and
15 receiving said output signal generated by said flow measurement device,
said controller causing said adjustable orifice in said flow control device
to open or close as necessary to maintain the flow of pressurized fluid as
measured by said flow measurement device within pre-determined
limits.

20

2. The device as claimed in claim 1 wherein said flow control device includes an automatically adjustable choke or valve.
3. The device as claimed in claim 1 wherein said flow measurement device
5 includes a turbine in communication with said stream of pressurized fluid.
4. The device as claimed in claim 1 wherein said flow measurement device includes a pressure sensor and said output signal comprises a pressure signal.
- 10 5. The device as claimed in claim 1 wherein said flow measurement device includes a pitot tube, the output of said pitot tube operatively connected to said controller.
6. The device as claimed in claim 1 wherein said flow measurement device
15 includes a pilot pressure tube, said pilot pressure tube having a first end in communication with said conduit and a second end in communication with said controller.
7. The device as claimed in claim 1 wherein said controller is a microprocessor
20 control, said microprocessor control programable to automatically adjust said orifice in said flow control device in accordance with fluctuations in said output

signal received from said flow measurement device to maintain the flow of fluid as measured by said flow measurement device within a pre-determined range.

8. The apparatus as claimed in claim 1 wherein said flow measurement device is
5 operatively connected to said conduit upstream of said flow control device.
9. The apparatus as claimed in claim 1 wherein said flow measurement device is
operatively connected to said conduit downstream of said flow control device,
said flow measurement device measuring the rate of flow of fluid released by
10 said flow control device.
10. An apparatus to control the rate of flow of pressurized fluid through a conduit
connected to a pump, the apparatus permitting the discharge of fluid from said
conduit at a rate below the output rate of the pump, the apparatus comprising:
- 15 (i) a flow measurement device operatively connected to said conduit and
generating an output signal proportionate to the rate of flow of said fluid
therethrough;
- (ii) an adjustable flow control device operatively connected to said conduit,
said flow control device permitting a portion of said pressurized fluid to
20 be independently released from said conduit to maintain the flow of
pressurized fluid as measured by said flow measurement device within

pre-determined limits.

11. The device as claimed in claim 10 including a visual indicator responsive to said output signal generated by said flow measurement device.

5

12. The device as claimed in claim 11 wherein said visual indicator comprises a gauge indicating the volumetric flow of fluid as measured by said flow measurement device.

- 10 13. The device as claimed in claim 10 including a controller operatively connected to said flow control device and receiving said output signal generated by said flow measurement device, said flow control device including an adjustable orifice, said controller upon receiving said output signal generated by said flow measurement device causing said adjustable orifice in said flow control device to open or close as necessary to maintain the flow of pressurized fluid as measured by said flow measurement device within pre-determined limits.
- 15

14. The device as claimed in claim 13 wherein said controller is a microprocessor control, said microprocessor control programmable to adjust said flow control device to maintain the flow of fluid as measured by said flow measurement device within a pre-determined range.
- 20

15. The device as claimed in claim 10 wherein said flow measurement device includes a turbine in communication with said pressurized fluid passing through said conduit.

5

16. The device as claimed in claim 10 wherein said flow measurement device includes a pressure sensor and said output signal comprises a pressure signal.

17. The device as claimed in claim 10 wherein said flow measurement device includes a pitot tube.

10

18. The device as claimed in claim 10 including a pilot pressure control tube having a first end in communication with said conduit and a second end in communication with said flow control device, said flow control device including an orifice adjustable in response to fluctuations in fluid pressure within said pilot pressure control tube whereby adjustments to the size of said orifice alters the volume of fluid released from said conduit by said flow control device to thereby maintain the flow of fluid as measured by said flow measurement device within pre-determined limits.

15

20

19. The apparatus as claimed in claim 10 wherein said flow measurement device is

operatively connected to said conduit upstream of said flow control device.

20. The apparatus as claimed in claim 10 wherein said flow measurement device is operatively connected to said conduit downstream of said flow control device, said flow measurement device measuring the rate of flow of fluid released by said flow control device.
21. A method of controlling the rate of flow of a stream of pressurized fluid through a conduit, the method comprising the steps of:
- (i) determining the rate of flow of fluid through a portion of said conduit and generating a signal proportionate to said fluid flow rate;
 - (ii) directing said signal to a controller operatively connected to a flow control device, said flow control device operatively connected to said conduit and including an adjustable orifice wherein upon the opening of said orifice a portion of said stream of pressurized fluid is independently released from said conduit by said flow control device; and,
 - (iii) with said controller, comparing said signal to a pre-determined value and activating said flow control device to open or close said adjustable orifice as necessary to maintain the flow of pressurized fluid as measured by said flow measurement device within pre-determined limits.

22. The method as claimed in claim 21 wherein said step of determining the rate of flow of said fluid through said portion of said conduit includes the utilization of a turbine placed in communication with said stream of pressurized fluid such that the rotation of said turbine results in the generation of said signal.

5

23. The method as claimed in claim 21 wherein said step of determining the rate of flow of said pressurized fluid through said portion of said conduit includes the measurement of the pressure of said fluid in said portion of said conduit and the generation of a proportionate pressure signal.

10

24. The method as claimed in claim 21 wherein said controller is a microprocessor control, said method further including the step of programing said microprocessor control to automatically adjust said orifice in said flow control device in accordance with fluctuations in said signal to maintain the flow of fluid as measured by said flow measurement device within a pre-determined range.

15

25. A method to control the rate of flow of pressurized fluid through a conduit connected to a pump, the method permitting the discharge of said fluid from said conduit at a rate below the output rate of the pump, the method comprising the steps of:

20

- (i) with a flow measurement device determining the rate of flow of fluid through a portion of said conduit and generating a signal proportionate to said fluid flow rate; and,
- (ii) comparing said generated signal to a pre-determined value and activating an adjustable flow control device operatively connected to said conduit to permit a portion of said pressurized fluid to be independently released from said conduit to maintain the flow of pressurized fluid as measured by said flow measurement device within pre-determined limits.

26. The method as claimed in claim 25 including the further step of directing said signal to a controller operatively connected to said adjustable flow control device, said controller upon receiving said signal causing said adjustable flow control device to open or close as necessary to maintain the flow of pressurized fluid as measured by said flow measurement device within said pre-determined limits.